**PAST PAPER PRACTICE QUESTIONS - SOLUTIONS**

**PART ONE**

**CELLS, ENZYMES AND DIGESTION**

**INSIGHT 2011**

SECTION A – Multiple-choice questions

Question 1

A feature NOT found on a compound light microscope is

A. a condenser.

B. an eyepiece lens.

C. electromagnetic lenses.

D. a fine focus knob.

Answer is C

Explanatory notes

• A is incorrect – a condenser is found on a compound light microscope.

• B is incorrect – an eyepiece lens is found on a compound light microscope.

• C is correct – electromagnetic lenses are associated with electron microscopes (transmission and scanning) NOT compound light microscopes (which have glass lenses).

• D is incorrect – a fine focus knob is found on a compound light microscope.

Question 2

Four structures were viewed under a microscope and measured. Which of the following series of measurements occurs in descending order?

A. 0.1 nm, 0.85 nm, 0.1 μm, 0.85 μm

B. 0.1 μm, 0.85 μm, 0.1nm, 0.85 nm

C. 0.85 nm, 0.1 nm, 0.85 μm, 0.1 μm

D. 0.85 μm, 0.1 μm, 0.85 nm, 0.1 nm

Answer is D

Explanatory notes

1 micrometre (μm) = 1000 nanometres (nm)

• A is incorrect – this series of measurements appears in ascending order.

• B is incorrect – this series of measurements moves from micrometres to nanometres, however, 0.1 μm is smaller than 0.85 μm.

• C is incorrect – even though 0.85 nm is greater than 0.1 nm, this series of measurements moves from nanometres to micrometres.

• D is correct – this series appears in descending order.

Question 3

Cells vary widely in terms of their size and function. Three features they share in common are

A. metabolism, chloroplasts and a plasma membrane.

B. flagella, a plasma membrane and mitochondria.

C. chloroplasts, ribosomes and a nucleus.

D. a plasma membrane, cytoplasm and metabolism.

Answer is D

Explanatory notes

• A is incorrect – not all cells have chloroplasts.

• B is incorrect – not all cells have flagella.

• C is incorrect – not all cells have chloroplasts or ribosomes.

• D is correct – all cells share these features in common.

Question 9

These structures are the site of an energy transformation process essential to living organisms. The process which occurs can be summarised as

A. C6H12O6 + 6O2 → 6CO2 + 6H2O

B. C6H12O6 + 6CO2 → 6O2 + 6H2O

C. 6CO2 + 6H2O → C6H12O6 + 6O2

D. 6CO2 + 6O2 → C6H12O6 + 6 H2O

Answer is C

Explanatory notes

• A is incorrect – this is the chemical equation for the process of cellular respiration.

• B is incorrect – this is the chemical equation for the process of cellular respiration with jumbled reactants and products.

• C is correct – this is the chemical equation for the process of photosynthesis which occurs in the chloroplasts.

• D is incorrect – this is the chemical equation for the process of photosynthesis with jumbled reactants and products.

Question 10

Fresh produce, which includes fruits and vegetables, are often cooled and then transported in refrigerated vehicles from growers to consumers. Some produce is kept in a confined space with controlled oxygen and carbon dioxide levels and in some instances, to lengthen shelf life, the surface of produce is coated with wax. These three strategies are designed to prevent deterioration of produce which will occur due to continued

A. photosynthesis.

B. metabolism.

C. respiration.

D. cellular respiration.

Answer is D

Explanatory notes

The process of cellular respiration produces heat. The increase in heat around the produce increases the rate of cellular respiration, producing even more heat which leads to deterioration of the produce.

* A is incorrect – photosynthesis does not contribute to the deterioration of produce.

• B is incorrect – metabolism is the total of all the chemical reactions that occur within an organism; they do not all contribute to the deterioration of produce.

• C is incorrect – respiration is the term used to describe inhalation and exhalation of air, which doesn’t occur in produce.

• D is correct – cellular respiration leads to deterioration of produce.

**TSSM 2012**

Question 1

Answer: D

Explanation:

Not all living cells have membrane bound organelles such as mitochondria and lysosomes.

Prokaryotic cells lack a nucleus. This means that options A, B and C cannot be correct. All living cells have a plasma membrane, cytosol and ribosomes.

Question 2

Answer: B

Explanation:

A, C and D are all incorrect as all living cells have ribosomes, DNA and a plasma membrane.

Only eukaryotic cells have a true membrane bound nucleus.

Question 3

Answer: D

Explanation:

This diagram represents a Golgi body; a series of flattened sacs with vesicles budding off from it.

Question 6

Answer: B

Explanation:

Although all of the molecules mentioned are associated with plasma membranes, phospholipids form the framework of the membrane and are the most abundant.

Question 7

Answer: A

Explanation:

Macromolecules that are not lipid soluble are unable to cross the membrane directly. They are engulfed by the plasma membrane and taken into the cell by the process of endocytosis.

Question 9

Answer: D

Explanation:

If the substrate had been used up the reaction would cease and the curve would return to the X axis. The graph shows that the reaction has reached a constant rate, but has not stopped. If the

temperature had been decreased the graph would show the reaction rate decreasing, since this has not happened, temperature cannot be causing the effect seen. If the enzymes were denatured the reaction would also cease. The point shown on the graph is the point of saturation which is reached when the substrate concentration increases to the point where all active sites are occupied and the reaction rate plateaus.

Question 11

Answer: C

Explanation:

Heterotrophs are unable to produce organic compounds. They obtain their requirements by consuming other organisms.

Question 12

Answer: A

Explanation:

Breaking down carbohydrates into simple sugars is an example of chemical digestion.

Question 13

Answer: D

Explanation:

The cardiac sphincter is located between the end of the oesophagus and the stomach. For fluids from the stomach to return to the oesophagus, the cardiac sphincter must not be working properly.

**INSIGHT 2011**

Question 14

Structure F is a

A. capillary.

B. lacteal.

C. villus.

D. microvillus.

Answer is A

Explanatory notes

• A is correct – structure F is a capillary.

• B is incorrect – structure F is a capillary, not a lacteal.

• C is incorrect – structure F is a capillary, not a villus.

• D is incorrect – structure F is a capillary, not a microvillus

Question 15

Answer is D

Explanatory notes

• A is incorrect – amino acids and monosaccharides are transported in the blood, not the lacteal.

• B is incorrect – glycerol and fatty acids are transported via the lymph, not in the blood.

• C is incorrect – amino acids and monosaccharides are transported in the blood, not the lymph.

• D is correct – glycerol and fatty acids are transported via the lymph.

**SHORT ANSWER QUESTIONS**

**INSIGHT 2011**

QUESTION 4

**4a. i.** **Solution**

omnivorous

**4a ii Solution**

**Tooth**

F**unction**

**A** – incisor 4

B – canine 2

C – premolar 1

D – molar 3

Mark allocation

• 2 marks – all 4 correct

• 1 mark – 2 or 3 correct

• 0 marks – 0 or 1 correct

**4b** Solution

Likely diet is meat because carnivores have a gut with a very long small intestine and small (if any) caecum

Mark allocation

• 1 mark – likely diet is meat

• 1 mark – carnivores have a gut with a very long small intestine and small caecum

**4c** Solution

Hippopotamus is a foregut fermenter. Foregut fermenters have small jaws and large stomachs and the majority of digestion occurs in the foregut thus there is no great need to expend a large amount of time and/or energy preparing food for going through the stomach to the small intestine.

Explanatory notes

Students are required to demonstrate a knowledge and understanding of the various modes of nutrition exhibited by vertebrates. It is expected that they will have the ability to relate dentition to diet. This includes being able to use skulls to make predictions about the features of the digestive system. In addition, students should be able interpret diagrams of the digestive systems of different mammals and make predictions about the diet of the animal.

Mark allocation

• 1 mark – correct identification of foregut fermenter

• 1 mark – correct justification for choice

Total 1 + 2 + 2+ 2 = 7

**2a. i.**

Solution

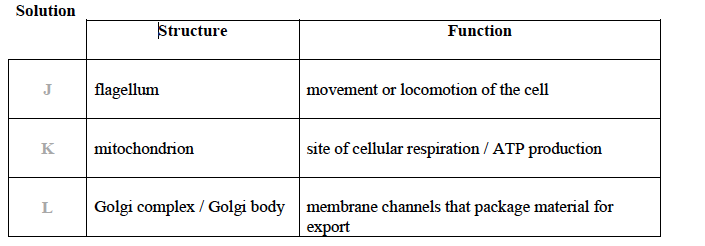
Cell B

**2a. ii.**

Solution

Eukaryotic cells display membrane-bound nuclei (and organelles), Cell A does not display this characteristic and Cell B does.

**2b**.



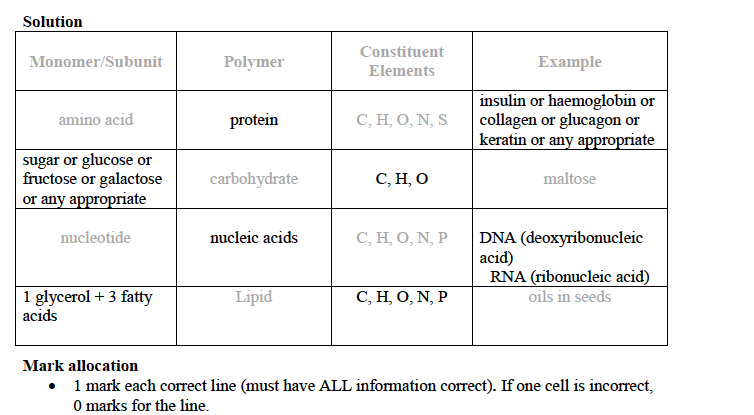
Solution

Mitochondrion and Golgi complex

Explanatory notes

Students need to demonstrate their understanding and knowledge of cell type, structure and function. They must be able to use their knowledge of cell structure to distinguish between eukaryote and prokaryote cells and to recognise and identify cell structures in prepared slides and images.

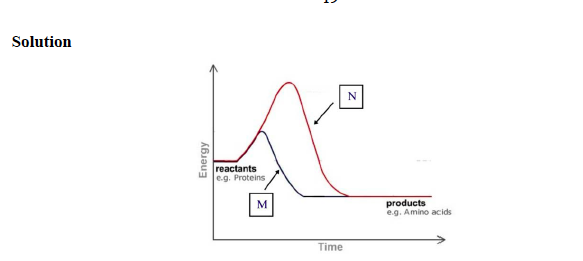
Total 1 + 1 + 3 + 1 = 6

**Question 3**

**Solution**

**3 b i Show specificity to molecule or bond type OR highly sensitive to extremes of pH and temperature (easily denatured) OR sensitive to inhibition by metabolic poisons.**

**3b. ii.**

**1 mark**

**Explanatory notes**

**A close working knowledge of the chemical basis of biological molecules is essential. Students must be able to demonstrate that they can identify the constituent elements that comprise the macromolecules and be able to cite examples of each type. A close knowledge of enzymes as biological catalysts is required. This includes an awareness of the factors that affect the structure and function of an enzyme. In addition, a clear understanding of the role that enzymes play in biological processes (particularly metabolism) is essential. In particular, as biological catalysts, enzymes work by lowering the activation energy required for a reaction. If enzymes are not present, a greater activation energy is required to progress a reaction. If enzymes are present, the activation energy required to progress a reaction is much lower. As a result, products are formed faster and reactions reach a state of equilibrium more rapidly.**

**3b. iii. 2 marks**

**Solution**

**At temperatures below 37°C, the rate of movement of molecules in enzymes and substrates decreases. There are fewer opportunities for the formation of enzyme-substrate complexes and as a result, the rate of reaction slows down.**

**Explanatory notes**

**A close working knowledge of the chemical basis of biological molecules is essential. Students must be able to demonstrate that they can identify the constituent elements that comprise the macromolecules and be able to cite examples of each type. A close knowledge of enzymes as biological catalysts is required. This includes an awareness of the factors that affect the structure and function of an enzyme. In addition, a clear understanding of the role that enzymes play in biological processes (particularly metabolism) is essential.**

**Mark allocation**

**• 1 mark – below 37°C the rate of movement of molecules decreases**

**• 1 mark – opportunities for the formation of enzyme-substrate complexes diminished, therefore the rate of reaction slows down**

**Total 4 + 1 + 1 + 2 = 8**

**TSSM 2012**

**Question 1**

**a. Osmosis**

**1 mark**

**AND**

**The diffusion of water across a semi permeable membrane from an area of high water**

**concentration to an area of low water concentration.**

**1 mark**

**b. The solution concentration.**

**1 mark**

**c. The following variables need to be controlled: the volume of solution, size of the potato**

**cylinders, all cylinders need to be in the solution for the same period of time, the beakers all**

**needed to be the same size, any other reasonable suggestion.**

**1 mark**

**AND**

**It is essential that all variables except the independent variable are controlled because if there**

**is more than 1 uncontrolled variable then the experimenter could not be certain which had**

**caused the result, making the experiment invalid.**

**1 mark**

**d. The mass of the cylinder will increase.**

**1 mark**

**AND**

**The solute in beaker 2 is hypotonic with respect to the potato cells; therefore water will**

**diffuse into the potato cells along the concentration gradient of water. (Since the solute**

**concentration is higher inside the cells than outside the cells the concentration of water must**

**be higher outside the cells than inside them, this establishes a concentration gradient)**

**1 mark**

**Question 2**

**a. Structure 1, the mouth.**

**1 mark**

**b. Structure 14, the small intestines.**

**1 mark**

**c. The caecum/appendix**

**1 mark**

**The caecum is where the microbial fermentation of cellulose occurs. The human diet**

**generally contains a lot less cellulose than that of rabbits, making a large caecum**

**unnecessary.**

**1 mark**

**d. The person will need to reduce their intake of fats.**

**1 mark**

**AND**

**The role of the gall bladder is to store bile and release it into the small intestines when fat**

**emulsion is required.**

**1 mark**

**AND**

**If insufficient bile is secreted fats cannot be digested properly.**

**1 mark**

**Question 3**

**a. Enzyme B**

**1 mark**

**AND**

**The optimum temperature for this enzyme is shown to be approximately 37ºC, which is**

**the optimum temperature for human enzymes.**

**1 mark**

**b. For an enzyme catalysed reaction to occur the enzyme and substrate must collide and bind.**

**The rate of collision is determined by the kinetic energy of the particles.**

**1 mark**

**AND**

**Increasing the temperature from 10ºC to 15ºC increases the kinetic energy therefore**

**increasing the reaction rate.**

**1 mark**

**c. The function of enzymes is to catalyse or speed up biological reactions.**

**1 mark**

**AND**

**Enzymes decrease the activation energy of the reaction allowing it to proceed at a faster**

**rate.**

**1 mark**